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ABSTRACT

Clarification of one aspect of Jensen's model of cognitive abilities provided the impetus for this study. Jensen found that sentence construction as a mediator facilitated learning of paired associates, except when kindergarteners were used as subjects. The purpose of the present study is to determine whether the failure of the mediators to facilitate the performance of young children is due to the fact that they do not know what a "sentence" is, or because they are unable to "mediate" when mediators are provided. The influence of experiential factors in language development was measured by using children from two different social classes. Also studied is the ability to transfer mediation strategy. Subjects were 32 kindergarten boys randomly selected from a predominantly white lower class urban school and a middle class white suburban school. The testing procedures are extensively described. Results gleaned from the study suggest that: (1) a mediation condition was more facilitating for middle class subjects; (2) lower class subjects exhibited a different strategy in approaching learning problems and were less proficient in generating sentences: and (3) providing mediators for young subjects does affect the learning of paired associates. Further study is suggested. (TL)

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The present study was done in place of the proposed "Interference Effects in Paired Associate Learning" for two reasons. First, as a result of a review of the literature, the procedures used in this study seemed more relevant than those proposed. In effect, this procedure had already been used and appeared to be more valid in answering the questions under consideration. Second, it was decided that the language training project (for which the present study was originally designed to evaluate) had obviously not been of long enough duration to have any effect on the ability for the young Ss to mediate. Therefore, it was decided to use Ss from different social classes as the two groups assuming that the middle-class Ss would be more experienced in language.

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Jensen (1969) has recently proposed a model of cognitive abilities which arranges types of capacities on a continuum from ability to master associative tasks (Level I) to ability to master complex cognitive or conceptual tasks (Level II). He has further suggested that "two genotypically distinct basic processes" underly this continuum. Level I involves "neural registration" with little transformation of input while Level II requires some sort of cognitive manipulation.

One method Jensen uses to illustrate these different levels (others are listed in Jensen, 1969) is by comparing rate of paired associate learning with rate of serial learning. Jensen believes that serial learning is more basic and represents the Level I process while paired associate learning is more dependent on past experience and represents Level II. His evidence for the hypothesized difference (Jensen and Rohwer 1963, 1965) consists of the demonstration that instructing the S to construct a sentence using word pairs (nouns) facilitated the learning of paired associates but not serial learning. This facilitation, however, was not found when kindergarteners were used as Ss. The latter finding was initially interpreted to be because the younger Ss did not know what was meant by the request "Construct a sentence" and therefore connected the two words with a conjunction. Rohwer (1964) and Davidson (1965) have both found that conjunctions do not serve as effective mediators. Later, however, (Jensen, 1969) used this finding as evidence for the slower rate of development of Level II abilities.

Jensen is somewhat unclear just exactly what part of the paired associate task he considers represents Level I and what represents Level II. The present E's interpretation is that the learning of the pairs without mediators is a case of Level I while the process of mediation itself (indicated by less trials to criterion when mediated conditions are added) is a Level II task. If this interpretation is correct then the Jensen and Rohwer study does not necessarily indicate that Kindergarteners can not mediate since most young S's are unable to produce sentences.

The purpose of the present study was to determine whether the inability of the mediators to facilitate the performance of young children in Jensen and Rohwer's study was due to the fact that they did not know what a "sentence" was or because they were unable to "mediate" when mediators were provided. In addition, the Es felt that one way of initially looking at the influence of language based on experiential factors on mediation was to compare the performance of Ss from different social classes. Finally, the Es wanted to look at the ability to transfer the mediation strategy to a second list of words when no mediators were provided. Although Rapier (1968) failed to find any transfer effects using older children, the lists she used were presented on separate days and the Ss may well have perceived them as separate tasks on which separate strategies were to be used, or as she suggests her Ss may have already been mediating.

Subjects

Subjects were 32 kindergarten boys randomly selected (16 from 50 boys in one school and 16 from 65 boys in the other) from two public schools. The first was an urban school located in a predominately white (25% colored Ss in the school and three of the 16 in this study were

colored with two in the mediation and one in the no mediation condition) lower-class neighborhood while the second was a suburban school located in a middle-class white neighborhood.

Procedure

Each S was required to perform on two lists of paired associates (5 pairs per list). The lists used are shown in Table 1 and were made up of nouns randomly selected from the 45 singular nouns used as stimuli in gathering the oral word association norms from young children by Palermo and Jenkins (1966). Outline drawings of the objects these words represented were then made, photographed, and reproduced as 35mm slides. These slides were projected on a 9 x 9 inch screen by a Sawyer 707Q slide projector. The projector was operated automatically by two Hunter Timers. The first object was presented for 4 seconds by itself and then two objects were shown together for 4 seconds. The intertrial interval was 8 seconds. The actual lists were arranged in five random orders with the limitation that no single pair was to occur consecutively.

Prior to the experimental task, each S was presented a three-pair list to a criterion of two perfect trials to be sure the children understood the instructions. Half of the Ss were simply required to learn each list in the common anticipation situation. The E would name each object and the first time through when the two objects appeared together the S was required to pronounce the two words out loud connected by "and". For the remainder of the trials the S simply gave what he thought the response word was or remained silent when the stimulus word was presented.

The other half of the Ss were required to repeat the words during the first trial and the warm-up using a sentence to connect them. Each sentence (see Table I) of the first list connected the words with a verb.

Rohwer, Lynch, Levin and Suzuki (1967) found that verbs produced more mediation than prepositions or conjunctions. The second list was then presented to the second group in the same fashion as the first group. The instructions are shown below. Condition I (no mediation) S presented only the instructions outside the parentheses. All lists were counterbalanced so that each condition received list A-B and C-D first an equal number of times.

> I am going to show you some pictures. I will tell you the names of the pictures. Try to remember the names. First you will see only one picture--Show the first slide and name it--the next time you will see the picture you saw first with a second picture--Show the second slide and name it--See now there is a_____ and a _____.
>
> When the first picture comes on, your job is to guess what the second picture will be before it comes on. (I'll tell you some sentences to help you remember the words. Here is the first sentence. You don't have to remember the sentences, just the names of the pictures.)
>
> Let's go to the other pictures--Go through slides 3,4,5, and 6 and name each--Now you try it. Remember your job is to tell us what picture will be on the next slide when you see a slide with only one picture on it. You have to say what picture goes with the other picture you see.
>
> O.K. Let's try it again with the same pictures.

Insert Table I about here

Results

To determine the mediation effects, separate t tests were computed for each school on the first trial comparing the sentence and no-sentence conditions. For the urban school, the means for the two groups were almost identical but for the middle-class school the difference approached significance (+=1.42, 14 df, p<,10). Subsequently a 2 (school) x 2

(treatment) x 2 (first and second presentation, the repeated measure) repeated measures analysis of variance was computed. There were no significant main effects, but there was a significant treatment x first and second presentation interaction ($F = 5.4$, 1/28 df, $p < .05$). This was due to the fact that Ss in the sentence conditions made more errors on the second list while the opposite was true for the no-sentence condition. This is especially evident for the lower-class Ss. It is almost as if the Ss were trying to use the strategy given them with the first list and it interfered with their ability to learn the pairs in the second list. Rapier (1968) also mentions that some of her Ss spontaneously indicated that trying to make up sentences interfered with the learning of the pairs. She suggests that this may be one reason she failed to get significant mediation transfer effects. The school by treatment interaction also approached significance ($F = 3.3$, 1/28 df. $p < .10$). As mentioned earlier the mediation condition was more facilitating for the middle-class Ss.

In order to further break down the analysis the E performed separate 2 (condition) x 2 (trial, the repeated measure) repeated measures analysis of variance for schools using the error terms from the three way analysis (see Winer 1962). Here the treatment by trial interaction was significant only for the lower class Ss ($F = 5.7$, 1/28 df, $p < .05$).

Finally, separate 2 (school) x 2 (trial, the repeated measure)

repeated measures analysis of variance were computed for each condition. In the mediation condition there was a significant school by trial interaction ($F = 5.72$, $1 + 28$ df, $p < .05$). The lower-class Ss did better in trial one and worse in trial two.

The picture which emerges from the results is that the sentence condition does have an effect and this effect is different for the two social classes. For the middle-class Ss there is evidence of mediation occurring while for the lower-class Ss the evidence is less impressive. This could be true, however, because the lower-class Ss do so well in the no-sentence condition. It actually appears that they are already more proficient than the middle-class Ss in associative learning unassisted by past experience. In other words, the lower-class Ss in kindergarten are already exhibiting a different strategy in approaching learning problems and to try another strategy (to mediate) greatly interferes with their performance. Again, they may be less proficient at generating sentences.

Insert Table 2 about here

With regard to the specific purpose of the study then, we can say that providing mediators for young Ss does have an effect on the learning of paired associates. Although this effect needs to be carefully replicated before any definitive statements can be made, it now appears that we must be careful to specify what we think is happening with regard to Level I and Level II learning ability. It may be that the ability to mediate is already present in the kindergarten Ss but the language experience which is needed to mediate is missing. This interpretation is born out by the results of a study by Gahagan and Gahagan (1968) which indicated

that Ss who participated in a two-year language training program produced significantly more verb connectors for eight pairs of nouns than control groups and that number of verbs produced correlated significantly with trials to criterion in a subsequent paired associate task using the same nouns. The latter study did not have a no-mediator condition to explore the effect of the language training program on learning pairs without generating mediators. In any case more evidence is needed along with a clearer delineation of just exactly what part of the paired associate task represents Level I and what part Level II before inferences can be made concerning the rate of development of each.

Finally, we would like to make a methodological comment which may be relevant for any study in the future. The Es noted a difference in attention span between the two social classes. The lower class child would often have to be prompted before giving any response. It is extremely easy for experimenter bias to result from such a situation.

The present Es plan to replicate the study with larger ns and this effect controlled for.

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Table 1

Sentences and Word Pairs Used*

WARM UP

THE DOG IS CHASING THE SHEEP
THE BIRD IS FLYING OVER THE MOUNTAIN.
THE DOOR IS BIGGER THAN THE GIRL.

A-B

THE HOUSE HAS A GUN.
THE FINGER IS POINTING AT THE LADY.
THE NEEDLE STICKS OUT OF THE CHEESE.
THE LION SEES THE SCISSORS.
THE BABY IS PLAYING WITH THE CAR.

C-D

THE SPIDER SCARES THE MAN.
HIS HAND LIFTS THE LAMP.
THE BED IS BIGGER THAN THE DOG.
THE TABLE HOLDS THE HAMMER.
THE DOCTOR IS SITTING ON THE CHAIR.

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*Words are underlined

Table 2

Mean Errors and Standard Deviations for all Groups

		List 1	List 2
Lower Class	Mediation	$\bar{X}$ 6.75 S.D. 8.3	14.62 11.9
	No Mediation	$\bar{X}$ 7.75 S.D. 4.1	5.75 2.3
Middle Class	Mediation	$\bar{X}$ 6.50 S.D. 6.5	7.87 4.3
	No Mediation	$\bar{X}$ 11.75 S.D. 6.9	10.37 4.5